

NON-PUBLIC?: N
ACCESSION #: 8808160440
LICENSEE EVENT REPORT (LER)

FACILITY NAME: McGuire Nuclear Station, Unit 1 PAGE: 1 of 6

DOCKET NUMBER: 05000369

TITLE: Unit 1 Reactor Trip Due to Failure of Primary Power Supply to the
Control Rods

EVENT DATE: 06/20/88 LER #: 88-013-01 REPORT DATE: 08/08/88

OTHER FACILITIES INVOLVED:

FACILITY NAME: Unit 2 DOCKET #: 05000370

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Steven E. LeRoy, Licensing TELEPHONE #: 704-373-6233

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On 6/20/88 at approximately 0005, while Operations (OPS) was shifting from the normal power supply to the alternate power supply on Shared Motor Control Center SMXS in order to prepare for testing on a Unit 2 load center, a Unit 1 Rod Control Urgent Failure alarm was received in the Control Room causing the Control Rods to drop into the core, thus initiating a High Negative Neutron Flux Rate Reactor Trip at 0005:52. The Turbine Generator automatically tripped on a Reactor Trip. OPS implemented the Reactor Trip recovery procedure to recover from the transient and initiated an emergency work request to troubleshoot the power supply for the Rod Control System. At approximately 1858, Instrument and Electrical (IAE) found and replaced failed auxiliary and primary power supplies for the Rod Control system. Unit 1 returned to power operation on June 21, 1988 at 0300. This event is assigned a Cause of Other because of the failure of the primary power supply for the Rod Control system. OPS will request Design Engineering evaluate redundancy requirements in the control system power supplies.

(End of Abstract)

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INTRODUCTION:

On June 20, 1988 at approximately 0005, while Operations (OPS) personnel were shifting from the normal power supply (EIIS:JX) to the alternate power supply on Shared Motor Control Center (EIIS:MCC) SMXS in order to prepare for testing on a Unit 2 load center, a Unit 1 Rod Control Urgent Failure alarm was received in the Control Room. At the same time, the Control Rods (EIIS:ROD) dropped into the core initiating a High Negative Neutron Flux Rate Reactor (EIIS:RCT) Trip at 0005:52. The Turbine (EIIS:TRB) Generator (EIIS:GEN) automatically tripped on a Reactor Trip. OPS implemented the Reactor Trip recovery procedure to recover from the transient. OPS initiated an emergency priority work request to have Instrumentation and Electrical (IAE) personnel troubleshoot the power supply for the Rod Control system. At approximately 1858, IAE found and replaced the failed auxiliary and primary power supplies in Power Cabinets (EIIS:CAB) 2AC and SCDE, respectively, for the Rod Control system (EIIS:AA). Unit 1 was returned to power operation on June 21, 1988 at approximately 0300.

Unit 1 was in Mode 1, Power Operation, at 100% power at the time of the event.

This event has been assigned a cause of Other because of the equipment failure of the primary power supply for the Rod Control system.

EVALUATION:

Background

The Full Length Rod Control system is used for Reactor control, Startup and Shutdown to compensate for short term reactivity changes. The Power Cabinet is a unit of the Full Length Rod Control system which functions to convert three phase alternating current (AC) input power into sequenced direct current (DC) pulses on demand from the Logic Cabinet. The DC pulses are then applied to the Control Rod Drive Mechanisms in a particular sequence to allow withdrawal or insertion of the Control Rods.

There are five Power Cabinets designated 1AC, 2AC, 1BD, 2BD, and SCDE, respectively. Each Power Cabinet is identical in circuitry and hardware and is capable of driving three groups of rods, each group consisting of up to five rods. With the exception of the SCDE cabinet, the letters in the Power Cabinet designation refer to the particular control banks which the cabinet is driving. The digit defines the group associated with each control bank. The SCDE designation means that Shutdown Bank C, D, and E rods are associated with that cabinet.

The Power Cabinets consist of three main power supplies and a duplicate set of three auxiliary power supplies. The main power supplies receive their AC input from the main power line which is supplied by the Control Rod drive motor generator sets. The auxiliary power supplies receive their AC input from an auxiliary power line. The redundant power supplies all perform an auctioneering function in that the supply with the highest instantaneous output will supply the load. If one of the primary supplies fail, the auxiliary supply takes over. The output of each supply is monitored by the non-urgent alarm circuits.

The auxiliary power supply that failed was a Lambda power supply, model no. LM-E-24, and the primary power supply that failed was a Lambda power supply, model no. LCS-A-24-6895.

Description of Event

On June 20, 1988, OPS personnel were preparing for a routine preventive maintenance test of the Unit 2 Shared Load Center Transformer 2SLXF, which is the alternate power supply for the Shared Motor Control Center SMXS. The normal supply for Shared Motor Control Center SMXS is from Shared Load center 1SLXF. OPS personnel verified the status of the power supplies for the Rod Control system, and no alarms or abnormalities were noted. At approximately 0005, OPS personnel were shifting from the normal power supply to the alternate power supply on Shared Motor Control Center SMXS and a Unit 1 Rod Control Urgent Failure alarm was received in the Control Room. At the same time, OPS Control Room personnel noticed the Unit 1 Control Rods dropping into the core, thus initiating a High Negative Neutron Flux Rate Reactor Trip at 0005:52. The Turbine Generator automatically tripped because of the Reactor Trip. OPS manually opened the Reactor trip breakers (EIIS:MJB) at 0005:57. OPS implemented the Reactor Trip recovery procedure, AP/1/A/5500/01, to recover from the transient. At 0006:23, a Main Feedwater (CF) System (EIIS:SJ) isolation occurred as designed on a Low T-average signal coincident with a Reactor Trip signal, and OPS manually started Motor Driven Auxiliary Feedwater (CA) System (EIIS:BA) Pumps 1A and 1B at 0007:17. OPS secured the CA pumps (EIIS:P) when the CF isolation was reset and CF restored.

OPS initiated an emergency priority work request to have IAE investigate the power supplies in the 2AC Power Cabinet because Shared Motor Control Center SMXS is a power source for the auxiliary power supplies for the Rod Control system. OPS made the required notification to the NRC according to the NRC Immediate Notification Requirements procedure, RP/0/A/5700/10, at approximately 0118.

IAE discovered a failed auxiliary power supply in Power Cabinet 2AC. The measured output of the failed power supply was approximately 18 volts DC instead of the required 24 volts DC. IAE personnel replaced and functionally verified the operation of the auxiliary power supply. IAE proceeded to check the operability of the power supplies in the other power cabinets and discovered a failed primary power supply in Power Cabinet SCDE. The failed primary power supply in Power Cabinet SCDE was the cause of power being lost to the Control Rods. For approximately 1.5 seconds, which is the approximate time it takes for OPS to transfer the Rod Control power sources, the primary power supply should have powered the Control Rods had it not malfunctioned. IAE personnel completed replacement and functional verification of the primary power supply at approximately 1858 on June 20, 1988.

Unit 1 was returned to power operation at approximately 0300 on June 21, 1988.

Conclusion

IAE personnel, investigating the loss of control power to the Control Rods found a failed auxiliary and primary power supply in the Rod Control System Power Cabinets. IAE replaced the auxiliary power supply with a new power supply from stock. The primary power supply was replaced with a primary power supply from Unit 2 because there was only one primary power supply in stock, and it failed while being bench tested. The Unit 2 primary power supply will be replaced during the current Unit 2 refueling outage. There is an alarm system which alarms locally as well as in the Control Room if a power supply failure occurs. However, the alarm setpoint is for a complete loss of power. The output of the unloaded failed power supplies was approximately 18 volts DC, and under loaded conditions the power supplies completely failed. Westinghouse issued a technical bulletin dated August 17, 1987 relating to the potential failure of Lambda Power Supplies. As a result of this bulletin, IAE initiated a Preventative Maintenance testing program on Unit 1 and Unit 2 power supplies. During the 1987 Unit 1 Refueling Outage, IAE personnel performed testing on the power supplies and there were no abnormalities noted. This event is assigned a cause of Other because of the failure of the primary power supply.

OPS personnel responded to the transient in a timely manner to stabilize the unit. There were a few anomalies noted during this Reactor Trip. Steam Generator A Power Operated Relief Valve, 1SV19 (EIIS:RV), opened and closed below its setpoint. This is a recurring problem related to "drift" in the pressure switches. IAE is implementing a quarterly calibration of these instruments to aid in determining the root cause of the drift problems. The Transient Monitor (EIIS:MON) data was unuseable because a

software problem occurred which precluded access to data prior to midnight. This problem was resolved with a software change. The Events Recorder (EIIS:XR) incurred a power interruption during the Reactor Trip which caused a false indication of a change of state on numerous points causing extended analysis time, and the output of the Events Recorder contained erroneous data. The Operator Aid Computer (OAC) (EIIS:CPU) Ventilation system also tripped during the unit trip. Apparently, control power transfer to the backup unit did not occur causing high OAC temperatures that impacted the OAC scanners resulting in some lost data.

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All primary and secondary system key parameters, with the exception of those noted above, responded as expected during the Reactor Trip. Approximately 30 minutes after the Reactor Trip, Pressurizer (EIIS:PZR) level and pressure, S/G level and pressure, and Reactor Coolant system (EIIS:AB) temperature had all achieved stable no-load conditions.

A review of McGuire Licensee Event Report (LERs) revealed 22 previous Reactor Trips caused by equipment failures; however, there were no component failures attributed to a failed power supply. Therefore, this event is considered non-recurring. The corrective actions for the other types of equipment failures could not have prevented this event from occurring.

This event is reportable to the Nuclear Plant Reliability Data System (NPRDS). A review of the NPRDS data base indicated that there have been a number of power supply failures to the Rod Control System. Some of the failures reported were caused by improper solder connections, internal faults, natural aging and wear, and unknown causes.

CORRECTIVE ACTIONS:

Immediate: OPS implemented the Reactor Trip recovery procedure.

Subsequent: IAE replaced the failed power supplies and performed a functional test of the power supplies in the Rod Control system.

Planned: 1) Maintenance will inspect and repair if necessary the restart timers on the OAC Ventilation system.

2) OPS will initiate a request to have Design Engineering personnel evaluate the redundancy requirements in Control system power supplies.

3) IAE will initiate a request to have Design Engineering

personnel modify the Events Recorder power supply circuitry.

4) IAE will investigate the power supply service life with Lambda.

SAFETY ANALYSIS:

The Reactor Trip was caused by a loss of power to the Rod Control system. The Turbine Generator automatically tripped on a Reactor Trip. This Reactor Trip initiating transient is bounded by the "Rod Cluster Control Assembly Misoperation" and the "Turbine Trip" events of the McGuire Final Safety Analysis Report Accident Analysis, Chapter 15.

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A CF system isolation occurred approximately 30 seconds after the Reactor Trip. The motor driven CA pumps were manually started approximately 1 minute after the trip to provide feedwater to the Steam Generators (EHS:SG) to maintain a heat sink. All primary and secondary system parameters necessary to assure a Safe Shutdown were at or approaching no-load conditions approximately 30 minutes after the trip. One Steam Generator (S/G) Power Operated Relief Valve (PORV), SV19, opened below the "open" setpoint range and closed below the "closed" setpoint range. The S/G Code Safety Valves, the Reactor Coolant (NC) system PORVs, and the NC System Code Safety Valves were not challenged.

Emergency core cooling and emergency electrical power were not required and were not actuated. The event presented no hazard to the integrity of the NC or Main Steam Systems (EHS:SB). There were no radiological consequences as a result of this event.

There were no personnel injuries, radiation overexposures, or releases of radioactive material as a result of this event.

This event is considered to be of no significance with respect to the health and safety of the public.

ATTACHMENT # 1 TO ANO # 8808160440 PAGE: 1 of 1

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NUCLEAR PRODUCTION

August 8, 1988

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Subject: McGuire Nuclear Station, Unit 1
Docket No. 50-369
Licensee Event Report 369/88-13-01

Gentlemen:

Pursuant to 10CFR 50.73 Sections (a)(1) and (d), attached is revised Licensee Event Report 369/88-13-01 concerning a Unit 1 reactor trip that occurred on June 20, 1988. This revision is being submitted to make minor corrections, and change bars are provided to indicate revisions. This report is being submitted in accordance with 10CFR50.73(a)(2)(iv). This event is considered to be of no significance with respect to the health and safety of the public.

Very truly yours,
/s/
Hal B. Tucker

SEL/312/bhp

Attachment

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